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Heterogeneity in Maltreated and Non-maltreated Preschool Children's Inhibitory Control: The Interplay Between Parenting Quality and Child Temperament

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Abstract

This study examined the contribution of child temperament, parenting, and their interaction on inhibitory control development in a sample of maltreated and non-maltreated preschool children. One hundred and eighteen mother–child dyads were drawn from predominantly low-income, rural communities. Dyads participated in a laboratory session in which maternal warm autonomy support, warm guidance, and strict/hostile control were observationally coded during a joint teaching task. Independent assessments of children's inhibitory control were obtained, and observers rated children's temperament. After relevant covariates, including income, maternal education, and child age and IQ were controlled for, there were no differences between the maltreatment and non-maltreatment groups in either children's inhibitory control or mothers' behaviours in the laboratory session. Even after much of the variance in children's inhibitory control was accounted for from the covariates, children's temperamental negativity moderated the effects of warm autonomy support on inhibitory control in both maltreatment and non-maltreatment groups. Temperamentally negative children whose mothers displayed more warm autonomy support showed greater inhibitory control, at levels on par with low-negative children. Findings suggest that heterogeneity in children's self-regulation may be due in part to individual differences in sensitivity to caregiver support for children's independence, even among those exposed to maltreatment.

Keywords

temperament; parenting; inhibitory control; preschool; maltreatment; self-regulation

One of the most important developmental skills children must learn is to self-regulate their behaviour. Self-regulation refers to children's self-initiated actions to manage their emotions and behaviours (Grolnick & Farkas, 2002; McCabe, Cunnington, & Brooks-Gunn, 2004), abilities that begin to emerge in toddlerhood and rapidly improve into the preschool years (Kochanska, Coy, & Murray, 2001; Kopp, 1982; Rueda, Posner, & Rothbart, 2005). One important aspect of self-regulation is inhibitory control, which involves an individual's ability to inhibit a dominant response to engage in a subdominant behaviour (Kochanska, Murray, & Coy, 1997; Kochanska, Murray, & Harlan, 2000). Children's inhibitory control functioning supports children's abilities to internally regulate emotion and voluntarily control behaviour (Bell & Deater-Deckard, 2007; Kopp, 1989; Rothbart, 2007) and in tum

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facilitates children's abilities to adhere to social standards and engage in prasocial behaviour (e.g., Kochanska et al., 1997). Further, deficits in inhibitory control have been linked to behaviour problems, poor social competence, and problems with school readiness (Blair, 2002; Blair, Zelazo, & Greenberg, 2005; Denham, Blair, DeMulder, & Levitas, 2003; Eckenrode, Laird, & Doris, 1993), highlighting the importance of inhibitory control in children's developing self-regulation skills.

Child maltreatment (CM) is a pervasive risk factor shown to exert detrimental effects on multiple domains of children's functioning, including deficits in attention focusing and inhibitory control (Beers & DeBellis, 2002; DePrince, Weinzierl, & Combs, 2009; Kreppner, O'Connor, & Rutter, 2001; Pears & Fisher, 2005; Pollak, Vardi, Putzer, & Curtin, 2005; Schatz, Smith, Borkowski, Whitman, & Keough, 2008). CM-exposed children are also more likely to develop serious pathology characterized by deficits in self-regulation (e.g., Cicchetti & Blender, 2004; Erickson & Egeland, 2002; Kolko, 2002; Rogosch, Cicchetti, & Aber, 1995) including anxiety issues, posttraumatic stress disorder, depressive disorders, early-onset conduct problems, personality disorders, and life course persistent antisocial behaviours (Kolko, 2002; National Institute of Mental Health, 2000; Patterson, Reid, & Dishion, 1992). However, despite the risk CM confers on children's development, not all CM children experience these detrimental outcomes (Cicchetti & Valentino, 2006). However, children's self-regulation development is multiply determined (McCabe et al., 2004), and therefore, there is a need to understand the role of both children's individual differences (e.g., temperament) and specific parenting behaviours (e.g., levels of warm autonomy support) that could explain variations in children's development even within the context of a history of maltreatment.

Parental Determinants of Self-regulation in Early Childhood

Beyond the broad social address effects of CM on children's developing self-regulation, countless studies to date have shown that the development of children's inhibitory control is enhanced by parenting characterized by warmth, sensitivity, and support (Grolnick & Farkas, 2002; Kopp, 1982; McCabe et al., 2004; Sroufe, 1996; Thompson, 1991) and is compromised under conditions of adversity (i.e., CM exposure; Gunnar & Fisher, 2006). More specifically, variability in parental control/guidance (i.e., warm vs. strict/hostile) and provision of age-appropriate support in warm ways for children's autonomous behaviour are important behaviours which influence children's development of self-regulation. Specifically, control and autonomy support that is warm and affiliative in nature (i.e., warm guidance and warm autonomy support) both foster a sense of connection between the parent and child. However, these two parenting constructs merely differ in the extent of control communicated by the parent. Warm guidance involves positive control in the form of watchful managing or supportive guidance, whereas warm autonomy support involves supportive and affirming parenting behaviour that promotes a child's independent ideas and actions.

Early in children's lives, parents play a significant role in helping their infants and toddlers externally regulate or manage their behaviour. According to Baumrind (1971, 1973), parenting that blends high levels of warmth with guidance and positive control results in favourable outcomes for children. More specifically, parental use of warm guidance in the early years has been shown to facilitate children's self-regulation development, in particular their compliance (Karreman, van Tuijl, van Aken, & Deković, 2006; Strand, 2002) and task persistence (e.g., Deater-Deckard, Petrill, Thompson, & DeThorne, 2006). Specific to children's inhibitory control, maternal warm guidance assessed during toddlerhood was associated with more rapid growth in parental ratings of preschool children's inhibitory control skills (Moilanen, Shaw, Dishion, Gardner, & Wilson, 2010).

Parents' warm support for children's age-appropriate autonomous behaviour (i.e., autonomy in connection) constitutes another central caregiving behaviour associated with inhibitory control development in the preschool years (Grolnick, Deci, & Ryan, 1997; Grolnick & Farkas, 2002). Children who experience more parental support for their developing autonomy display better effortful control (Landry, Miller-Loncar, Smith, & Swank, 2002; Lengua, Honorado, & Bush, 2007) and executive functioning abilities (Bernier, Carlson, & Whipple, 2010).

While there is some evidence that warm parental guidance provided early in children's lives enhances later regulatory capacities (e.g., Moilanen et al., 2010), as children develop into the preschool years, greater parent support for children's prosocial, autonomous strivings is thought to be essential for developing preschoolers' self-regulation of attention, emotion, and behaviour (Kopp, 1982; Thompson, 1991). In the case of maltreating parents, they often are less adept at engaging in both of these positive, warm types of parenting compared with non-maltreating parents (e.g., Dolz, Cerezo, & Milner, 1997), which may put maltreated children at further risk of developing poor inhibitory control abilities.

In contrast, negative and hostile forms of parental control—particularly characteristic of maltreating parenting (e.g., Cerezo & D'Ocon, 1995; Wilson, Rack, Shi, & Norris, 2008)—are detrimental for children's self-regulation development. Harsh and rigid parental control is related to poorer task performance (Winsler, Diaz, McCarthy, Atencio, & Chabay, 1999), poorer inhibitory control (Moilanen et al., 2010), and less autonomous self-regulated behaviour in children (Maughan & Cicchetti, 2002; Shields & Cicchetti, 1998; Trickett & McBride-Chang, 1995). In sum, studies of parenting suggest that warm autonomy support, warm guidance (i.e., positive control), and, conversely, strict/hostile control all playa central role in children's early inhibitory control development. The current study sought to clarify differences between CM and non-CM parenting and how variability in parental control (i.e., warm vs. strict/hostile) and warm autonomy support influence preschool children's inhibitory control development.

Temperament, Self-regulation, and Temperament × Caregiving Interactions

Although the caregiving environment plays a central role in children's self-regulation outcomes, the development of inhibitory control abilities is multiply determined (e.g., McCabe et al., 2004). Constitutionally based individual differences in children's temperamental reactivity (e.g., Rothbart & Bates, 2006) may predispose or facilitate children's self-regulation development. Children's level of temperamental negative reactivity (i.e., anger/frustration, irritability, sadness, and/or fear reactiveness) in response to their environment (Rothbart & Bates, 2006) has been consistently associated with children's overall adjustment. For example, greater temperamental negative reactivity in children is linked with more behaviour problems and later depression and aggression (e.g., Gilliom & Shaw, 2004; Lemery, Essex, & Smider, 2002; Mun, Fitzgerald, von Eye, Puttler, & Zucker, 2001; Rothbart, Ahadi, & Hershey, 1994). With respect to children's self-regulation skills, greater temperamental negativity has been linked to poorer performance on executive attention measures (Ellis & Rothbart, 2002) and less use of distraction during delay of gratification procedures (Raver, 1996). Further, greater anger reactivity in infants with lower regulatory abilities has been predictive of non-compliance in preschool children (Stifter, Spinrad, & Braungart-Rieker, 1999).

Beyond direct associations observed between self-regulation skills, children's temperament, and quality of caregiving, more recent studies, particularly those investigating the notion of 'differential susceptibility', have examined the moderating effects of temperament on relations between caregiving behaviour and children's behavioural outcomes (Belsky,

Bakermans-Kranenburg, & van Ijzendoorn, 2007; Ellis, Boyce, Belsky, Bakermans-Kranenbrug, & van IJzendoorn, 2011; Putnam, Sanson, & Rothbart, 2002). Temperamental characteristics such as children's fear (e.g., Kochanska, Askan, & Joy, 2007), activity level (e.g., Gandour, 1989), and resistance to control (e.g., Bates, Pettit, Dodge, & Ridge, 1998) appear to moderate the effects of caregiving behaviour on children's conscience development, behavioural inhibition, exploratory behaviour, and behaviour problems. According to Belsky (Belsky & Pluess, 2009; Belsky, 2005), relations between care-giving behaviour and subsequent child development may be stronger among children with particular temperamental qualities. Among those, negativity is a temperamental characteristic that has received much attention as a moderator of caregiving behaviour on children's outcomes (e.g., Belsky & Pluess, 2009). Specifically, children greater in anger proneness or negativity showed more externalizing problems when parents provided less guidance (Smeekens, Riksen-Walraven, & van Bakel, 2007) and were more hostile (Morris et al., 2002) or intrusive (Belsky, Hsieh, & Crnic, 1998). Temperamentally 'difficult' children, or those high in negativity or irritability, were rated greater on externalizing problems when parents used negative discipline strategies, whereas those whose parents employed more positive discipline techniques were rated with fewer problems (van Zeijl et al., 2007). Further, temperamentally difficult children showed larger decreases in externalizing problems over time when their parents were more sensitive (Mesman et al., 2009).

Evidence also points to intervention-based improvements in sensitivity among mothers of temperamentally negative/irritable infants producing positive outcomes for these children's subsequent functioning (e.g., greater attachment security and child cooperation; Cassidy, Woodhouse, Sherman, Stupica, & Lejuez, 2011; Ellis & Boyce, 2011; van den Boom, 1994, 1995). A few longitudinal studies have also documented associations between positive mother–child synchrony (Feldman, Greenbaum, & Yirmiya, 1999) and positive and less intrusive parenting (Poehlmann et al., 2011) in infancy and subsequent effortful control in toddlerhood, which appear stronger among temperamentally negative/difficult children. However, it is less clear whether temperamental negativity also would moderate relations between parenting in preschool and executive, attentional aspects of preschool children's self-regulation, deficits which are known to predict subsequent school readiness and behavioural problems (e.g., Blair, 2002; Denham et al., 2003). Further, little research has examined these processes in maltreated children, who are often identified as most vulnerable to developing self-regulation difficulties (e.g., Cicchetti & Toth, 2005; Shields & Cicchetti, 1998).

The Present Study

In this investigation, we sought to clarify mechanisms that underlie heterogeneity in maltreated and non-maltreated preschool children's inhibitory control development. Our first goal was to determine whether CM status and variations in the quality of proximal parenting would be associated with children's inhibitory control. Consistent with previous research (e.g., DePrince et al., 2009), it was hypothesized that CM children, compared to non-CM children, would perform poorer on inhibitory control. Likewise, parenting characterized by more warm autonomy support and warm guidance, and less strict/hostile control, was expected to be associated with better inhibitory control (e.g., Moilanen et al., 2010). We anticipated that differences between CM and non-CM children in inhibitory control could be partly explained by differences in the levels of these parenting behaviours.

Our main analysis focused on the interplay between temperamental negativity and parenting behaviours in explaining differences in children's inhibitory control, across both CM and non-CM groups. Specifically, we examined whether children's temperamental negativity

moderates relations between quality of parenting and children's inhibitory control. Consistent with previous research (e.g., Poehlmann et al., 2011), it was hypothesized that those children greater in temperamental negativity whose parents displayed more warm autonomy support, warm guidance, and less strict/hostile control during a joint lab challenge task would perform better on inhibitory control measures. Conversely, children high in negativity whose parents showed less support for child autonomy, less warm guidance, and more strict/hostile control were expected to show poorer inhibitory control. Finally, in order to determine whether the pattern of associations holds within a context of significant childhood adversity, we examined CM status as a potential moderator of these links.

METHOD

Participants

The sample of 118 mother–preschooler dyads consisted of 64 CM and 54 non-CM mothers and their 3–5-year-old children. Dyads were recruited from Child Protective Services (CPS), the Department of Public Welfare, and a university database and were eligible to participate if the mother was 18 years of age or older, was living with her preschool child, and spoke fluent English. According to the coding of family CPS records using the Maltreatment Classification System (MCS; Barnett, Manly, & Cicchetti, 1993), 28.1% of CM group mothers had engaged in physical abuse, 87.5% in physical neglect, and 37.5% in emotional maltreatment of their child, with 40.6% of mothers engaging in co-morbidity of CM subtypes (i.e., two or more documented: physical abuse, neglect, or emotional maltreatment). Non-CM mothers consented to verification that their families were free from CPS involvement. Children's average age was 3.7years (*SD*=0.74) and 52.1% were female. The majority of the children were Caucasian (79.8%), with 2.5% African American, and 16.2% multi-racial (two unreported). Mothers averaged 28.6 (*SD* = 5.52) years old. The majority of mothers were Caucasian (93.3%) and were married or in a committed relationships (63.5%), and approximately half (47.1%) were employed.

Comparisons between CM and non-CM dyads revealed no significant differences on children's age [$t(1, 116) = 0.21$, $p = .83$], gender [$\chi^2(2, N = 118) = 0.98$, $p = .56$], ethnicity [$\chi^2(2, N = 116) = 0.96$, $p = .62$], or mother's relationship status [$\chi^2(1, N = 118) = 0.62$, $p = .43$]. CM group differences were revealed on mother's years of education [$t(1, 116) = 4.35$, $p < .001$], household income [$\chi^2(3, N = 116) = 24.67$, $p < .001$], and children's IQ scores as measured using the Stanford Binet, Fifth Edition (SB-5, Roid, 2003) [$t(1, 113) = 3.26$, $p < .001$]. Non-CM mothers reported one and a half more years of education (*M* = 13.6 years) than did CM mothers (*M* = 12.1 years). Approximately 79.2% of non-CM families reported incomes below $50,000, whereas 98.4% of CM families reported incomes below $50,000. Further, non-CM children (*M* = 104) scored approximately eight points higher on IQ compared to CM children (*M* = 96).

Procedure

Mothers and their children participated in a three-visit protocol led by two trained interviewers over a 2–3-week period: two home visits (approximately 2 hours each) and one laboratory visit (approximately 2.5 hours). During the first two home visits, mothers were asked for demographic information and completed a series of psychosocial assessments, and mothers and children completed a cognitive assessment. During the laboratory visit, mothers and children participated in joint teaching tasks, mothers completed additional questionnaires, and children participated in a series of individual procedures designed to assess self-regulation. Electrocardiograph (ECG) was also monitored during all laboratory procedures. At the completion of the laboratory visit, the two interviewers who worked with the family for all three visits conferred together and rated children's temperament. Families

were paid $150 to complete the three interviews and were provided with transportation, snacks, and children's small toys/ gifts. For the present study, only demographic and cognitive assessments and procedures from the laboratory visit were used and are described in more detail below.

Measures

Child temperamental negativity—Children's temperamental negativity was assessed using the Observed Child Temperament Scale (OCTS; Stifter, Willoughby, & Towe-Goodman, 2008) at the completion of the laboratory visit, which is an adapted version of the Infant Behaviour Record (IBR; Bayley, 1969) for preschool children. From the observation of the child over the course of two home visits and the laboratory visit (approximately, 6–8 hours), the two interviewers working with the family conferred, came to a consensus, and rated children on a scale from 1 to 9 on their Frustration/Anger proneness (i.e., 1 = shows no evidence of frustration even during tasks designed to elicit frustration, 2 =*between 1 and 3*, 3 =*mildly frustrated but only in frustrating tasks*, 4 =*between 3 and 5*, 5 =shows moderate levels of frustration in frustrating task, 6 =*between 5 and 7, 7* =exhibits high levels of frustration in frustration tasks and some frustration in other tasks, 8 = *between 7 and 9*, and 9 = *easily frustrated*). To simulate conditions under which parents rated their children and to remain consistent with how the IBR is applied (Bayley, 1969), interviewers were minimally trained (approximately trained for 2 hours) by reviewing videos of children engaging in similar laboratory procedures and on the application of the scale prior to its use, including instilling a clear understanding of the definitions and types of behaviours that were rated (for details, see Stifter et al., 2008). Higher scores reflect greater negativity.

Parenting behaviour—The Structural Analysis of Social Behaviour (SASB; Benjamin, 1996; Benjamin & Cushing, 2000, see Figure 1) coding system was used to observationally code parenting behaviour during a 3–5-minute moderately challenging joint teaching task (i.e., Duplo Blocks; Hoffman, Crnic, & Baker, 2006). SASB is a pantheoretical coding system widely used to study psychotherapy interventions (e.g., Constantino, 2000; Henry, 1996), adult personality, and parent–child interactions (e.g., Florsheim, Tolan, & Gorman-Smith, 1996; Skowron, Kozlowski, & Pincus, 2010). Each pair of mother and child was seated together at a small table for the task, and the child was given coloured duplo blocks and instructed to build a figure identical to the model provided. Mothers were told they could help their child as they normally would at home but were instructed not to handle the blocks. Upon completion, the child was allowed to choose a sticker for his/her efforts. Verbatim transcripts of video-recorded interactions during the task were prepared and then unitized to indicate each 'speaking' turn, comprised of verbal, non-verbal, and other paralinguistic behaviours (i.e., smiling at child, moving child's hand away, and warm vs critical tone of voice).

The process of SASB coding each transaction turn involves three steps to determine (a) focus (other or self), (b) degree of affiliation (ranging from loving to hostile), and (c) interdependence [ranging from low (i.e., autonomous) to high (i.e., control–submit)] (Humphrey & Benjamin, 1986) to arrive at one of eight prototypical parenting behaviours distributed across the circumplex and shown in bold type in Figure 1. Four SASB codes were selected to operationalize warm autonomy support, warm guidance, and strict/hostile control. The remaining cluster codes were low-occurring events (means ranged from 0.00 to 0.01) and thus were not used in the present analyses. As shown in Figure 1, warm autonomy support is shown in SASB Cluster 2 (understanding/affirming) and combines both warm affiliation and autonomy granting (e.g., Mother asks, 'Where do you think the green block should go?'). Warm guidance is characterized by the SASB Cluster 4 (nurturing/protecting) behaviour and reflects a blend of warm affiliation and guidance or positive control (e.g.,

Mother says in a warm tone, 'You should try a green block there.'). Strict/hostile control is captured together by SASB Cluster 5 (controlling/managing; i.e., strict control) and Cluster 6 (blaming/criticizing; i.e., hostile control). These types of control have theoretically grounded ties with coercive parenting behaviours, which involve parental exertion of control in aversive and intrusive ways, and this type of control used by parents is associated with externalizing behaviours and self-regulation difficulties in children (i.e., Dodge, Bates, & Pettit, 1990). Additionally, SASB Clusters 5 and 6 were positively correlated (r = .30, p=. 001). Scores from Clusters 5 and 6 were summed to create the composite strict/hostile control code (e.g., Mother grabs child's hand and states, 'Stop messing around and get the green block, now!'). SASB cluster codes are proportional scores that reflect the proportion of speaking turns that mother was engaged in each parenting behaviour of interest, divided by the total number of mother speaking turns across the task.

SASB coding was conducted by successive teams of three trained coders working with the unitized transcripts and videotapes and who were blind to family CM status. Coders completed over 75 hours of training and coded using practice videos in order to achieve sufficient reliability (weighted kappa > 0.70) prior to coding. In the present study, weighted kappas were calculated on 15% of the sample and ranged from 0.53 to 1.0 (M = 0.74).

Inhibitory control—Children participated in two inhibitory control tasks: shapes (Kochanska et al., 1997) and day/night (Gerstadt, Hong, & Diamond, 1994). In the shapes task, the interviewer presented the child with three large and small pictures of fruits and then three pictures depicting a small fruit embedded in a different large fruit (e.g., a small orange pasted on a large banana). The child was asked to point to each of the small fruits (e.g., 'Show me the little banana') within the larger fruits. Children were given scores for the three trials in which they had to point to the little fruit embedded in the larger fruit and received a score of 0 (incorrectly identified), 1 (self-eorrected incorrect first response), or 2 (correct on first response) such that scores ranged from 0 to 6. In the day/night task (Gerstadt et al., 1994), 16 trials were completed in which the child is shown a series of cards with pictures of a sun or moon and instructed to say 'day' whenever they saw a card with a moon on it and to say 'night' when they saw a card with a sun on it. Children were scored on the 16 trials similarly to the scoring for the shapes task (0 =*incorrect response*, 1=*self-correcting their incorrect first response*, and 2 =*correctly identifying on the first response*). Scores ranged from 0 to 32. Shapes and day/night scores were positively correlated (r = .25, p=.005) and thus were standardized and summed to create a composite inhibitory control score. Higher scores reflected greater inhibitory control.

Child intelligence—An assessment of children's IQ was obtained during the first home visit using the SB-5 (Roid, 2003). A trained interviewer administered the two-subtest Abbreviated Battery IQ (ABIQ) to children, which included an assessment of children's verbal knowledge and nonverbal fluid reasoning. Scaled scores were obtained and summed to obtain a total, age-standardized ABIQ scaled score. SB-5 scores were included as a covariate in the primary analyses.

RESULTS

Preliminary Analyses

Descriptives for the study variables can be found in Table 1. No CM group differences were observed for temperamental Negativity, $t(1, 116) = -1.30$, p=.20, but children in the non-CM group scored higher on inhibitory control and mothers in the CM group scored higher on strict/hostile control. Correlations among study variables in the full sample and by CM subgroup are reported in Table 2. Within the entire sample, children rated higher on

temperamental negativity performed poorer on inhibitory control tasks, and inhibitory control was higher among those whose mothers showed more warm autonomy support and less strict/hostile control. No relations emerged between children's temperamental negativity and any of the parenting variables. Significant inverse associations were observed between strict/hostile controlling parenting and both types of warm affiliative parenting. Mothers who displayed more strict/hostile control were less likely to engage in warm autonomy support or warm guidance during the joint challenge task. This overall pattern of correlations was broadly similar within the CM and non-CM groups, except that links between inhibitory control and child negativity did not attain significance in either group and the inverse link between inhibitory control and strict/hostile control was significant only in the CM group.

Relations between child age, gender, SB-5 scores, and inhibitory control were examined. Greater inhibitory control was positively associated with child age (r = .38, p< .001) and children's SB-5 scores (r = .27, p = .006) but unrelated to child gender [$t(1, 106) = 0.35$, p = .73]. Additionally, children's inhibitory control scores were associated with income (r = .20, p = .05) and maternal education (r = .26, p = .007). Therefore, child age and SB-5 scores were entered as child covariates, and the socioeconomic indices (income and education) were entered as family-level covariates in the primary analyses.

Independent-sample t-tests were conducted to determine whether there were significant CM group differences on inhibitory control, warm autonomy support, warm guidance, and strict hostile control. Results revealed significant group differences on children's inhibitory control [$t(1, 105) = 2.22$, p=.03] and strict hostile control [$t(1, 116) = -2.06$, p=.04]. Non-CM children (M = 0.30) scored higher on inhibitory control compared to CM children (M = −0.38). Also, non-CM mothers (M = 0.23) used less strict/hostile control compared to CM mothers (M = .31). However, analyses of covariance (ANCOVA) on all the variables, with CM status as the between-subjects factor and maternal education, income, child age, and child SB-5 scores as covariates, showed no significant effects of CM status on children's inhibitory control ($F(1, 104) = 0.02$, p=.89), warm autonomy support ($F(1, 113) = 0.12$, p=.73), warm guidance ($F(1, 113) = 1.45$, p=.70), or strict/hostile control ($F(1, 113) = 0.98$, p=.32). Thus, after controlling for a substantial number of family context and child individual difference covariates that CM and non-CM groups differed on, no significant differences between the CM and non-CM groups on either inhibitory control or parenting behaviours during the laboratory session were revealed.

Parenting, Child Temperamental Negativity, and Inhibitory Control

We next turned our attention to the interplay between temperamental negativity and parenting behaviours as a predictor of children's inhibitory control, across both CM and non-CM groups. Three separate hierarchical regression analyses were conducted to examine the joint effects of CM status and temperamental negativity with each parenting behaviour (i.e., warm autonomy support, warm guidance, and strict/hostile control) on children's inhibitory control. Specifically, regression analyses for each of the parenting behaviours were conducted to (1) test whether temperamental negativity moderated relations between parenting and children's inhibitory control and (2) explore the three-way interaction between CM status, parenting, and child negativity, to determine whether Parenting Temperament Moderation effect(s) would vary by CM status.

In each of the three models, income and maternal education (family-level covariates) were entered in Step 1, followed by entry of child age and SB-5 scores (child covariates) in Step 2. In Step 3, CM status, the centred parenting behaviour, and centred child negativity scores were entered as predictors, and in Step 4, all possible two-way interactions were entered (i.e., CM Status × Negativity, CM Status × Parenting, and Negativity × Parenting), as per

the Aiken and West (1991) guidelines that stipulate all first-order and second-order terms be included. The three-way interaction term (i.e., CM Status × Negativity × Parenting) was entered in the final step. When significant interactions were observed, procedures recommended by Aiken and West (1991) were employed to examine the simple effects of each interaction.

For each model, the family-level (Step 1) and child-level (Step 2) covariates significantly predicted children's inhibitory control: $\Delta F(3, 100) = 3.02$, $p=.03$, and $\Delta F(2, 98) = 16.01$, $p=.001$, respectively. Specifically, greater child age [$t(1, 98) = 4.80$, $p=.001$] and higher scores on the SB-5 [$t(1, 98) = 3.61$, $p=.001$] all predicted higher child inhibitory control scores. With respect to children's CM status, neither its main effects, interactions with parenting, nor three-way interaction with parenting and temperamental negativity was significant in any of the models. Thus, following recommendations from Aiken and West (1991), all non-significant higher-order terms were trimmed from the final regression models (i.e., three-way interactions between CM Status × Negativity × Parenting, two-way interactions between CM × Parenting and CM × Negativity). The final regression models included the Step 1 and 2 effects of the family-level (CM status, maternal education, and income) and child-level covariates (child age and IQ), Step 3 temperamental negativity and parenting effects, and Step 4 Negativity × Parenting interaction effects.

The trimmed model testing the main effects of warm autonomy support (SASB Cluster 2) and temperamental negativity and the two-way interaction on children's inhibitory control was examined. As shown in Table 3, the main effects of warm autonomy support and negativity were near significant, $\Delta F(2, 96) = 2.71$, $p=.07$. Specifically, more warm autonomy support uniquely predicted higher inhibitory control scores, $t(l, 96) = 2.14$, $p=.04$. However, the main effect of warm autonomy support was subsumed under a significant Negativity × Warm Autonomy Support interaction, $\Delta F(1, 95) = 4.37$, $p=.04$. The interaction was probed at low (−1 *SD*) and high (+1 *SD*) levels of negativity. Maternal warm autonomy support predicted greater child inhibitory control at high levels of temperamental negativity, $B=4.91$, $t(1, 95) = 3.02$, $p=.003$, but not at low levels of negativity, $B=.62$, $t(1, 95) = 0.42$, $p=.67$. As shown in Figure 2, children greater in temperamental negativity whose mothers engaged in less warm autonomy support while interacting with them during a puzzle task challenge, performed poorer on an independent assessment of inhibitory control, while those whose mothers engaged in more warm autonomy support performed better on inhibitory control and at levels similar to children low in negativity. Among children low in temperamental negativity, no associations were observed between maternal autonomy support and inhibitory control scores.

Next, the trimmed model testing the main effects of maternal warm guidance (SASB Cluster 4) and negativity and their interaction (i.e., Negativity × Warm Guidance) was examined. As seen in Table 3, beyond the covariate effects, neither main effects of warm guidance and negativity, $\Delta F(2, 96) = 0.42$, $p=.66$, nor a Negativity × Warm Guidance interaction, $\Delta F(1, 95) = 0.05$, $p=.83$, was observed. Likewise, the main effects of temperamental negativity and strict/hostile control (SASB Clusters 5 and 6), $\Delta F(2, 96) = 1.50$, $p=.23$, and their interaction (i.e., Negativity × Strict/Hostile Control), $\Delta F(1, 95) = 1.02$, $p=.32$, were also non-significant.

DISCUSSION

The goal of this study was to examine the independent and joint contributions of parenting and temperament on children's self-regulation in maltreated and non-maltreated children. First, we observed CM group differences on children's inhibitory control and maternal use of strict/hostile control during a structured task. However, after considering the effects of important covariates associated with inhibitory control and parenting, including family

income, maternal education, and child IQ on which CM and non-CM groups did differ, these CM group effects were no longer significant. Specifically, after controlling for the large number of covariates, CM and non-CM children did not differ in either their inhibitory control abilities or parenting behaviours. However, despite the large amount of variance explained by both family-level and child individual characteristics, systematic variations in inhibitory control abilities could be explained by a combination of individual differences in temperament and parenting behaviours in both CM and non-CM children. More specifically, children's temperamental negativity moderated the link between maternal warm autonomy support and inhibitory control.

First, although significant CM group differences emerged on child inhibitory control and maternal use of strict/hostile control, these effects were no longer significant after the inclusion of both important family-level and child-level covariates. However, significant CM group differences were revealed on the covariates of income, maternal education, and child IQ. Research has consistently demonstrated that CM children have lower IQ's compared to their non-CM counterparts (e.g., Jaffee & Maikovich-Fong, 2011) and that IQ is highly related to children's self-regulatory abilities, including inhibitory control (e.g., Calero, García-Martín, Jiménez, Kazén, & Araque, 2007). Therefore, it is likely that the direct effects of CM on inhibitory control, after considering these covariates that differ by CM groups, are obfuscated. In other words, child IQ is absorbing a large portion of the variance in inhibitory control, and therefore, it is difficult to detect the independent effects of CM on inhibitory control given associations between CM status, IQ, and inhibitory control. Similarly, research has shown that CM families compared to non-CM families have lower education and income (e.g., Baumrind, 1994; Belsky, 1984, 1993). Given these large differences in maternal education and income in CM and non-CM families, it is possible that maternal education and income serve as proxies for CM status. Therefore, given the profound differences in these important covariates found in the current study between CM and non-CM families, it is possible that CM group effects on inhibitory control and parenting would emerge if CM and non-CM groups were sampled in a way to better match them on SES and child IQ. Future research is needed in which CM and non-CM families are matched on these important covariates to better capture the independent effects of CM on inhibitory control and parenting.

Despite the lack of a direct association between CM status and children's inhibitory control abilities after considering important covariates, variability in children's inhibitory control appears to be a function of their own temperamental characteristics and the parenting they experience. In line with the differential susceptibility hypothesis, evidence from research has demonstrated that temperamentally negative children are more sensitive to the quality of parenting received (e.g., Belsky et al., 2007), and the current findings extend these effects to variation in preschool children's inhibitory control skills and provide further evidence supporting the differential susceptibility hypothesis. Children high in temperamental negativity who experienced less maternal support for their autonomous behaviour during a standard laboratory task, showed poorer inhibitory control during independently assessed challenges. In contrast, children high in temperamental negativity whose mothers provided warm autonomy support showed better inhibitory control, on par with levels observed in less temperamentally negative children. These findings indicate that the combination of temperamental negativity and low parental support for autonomy together, appear to place all children at greater risk for poor inhibitory control, regardless if they have experienced maltreatment or not. Warm autonomy support is important for developing inhibitory control in preschool (Bernier et al., 2010). Due to their predisposition for poor self-regulation (e.g., Ellis & Rothbart, 2002), preschool children high in temperamental negativity are predisposed to be easily frustrated and thus may require extra parental support for their self-directed efforts to formulate and implement self-generated solutions to cognitive challenges.

Warm autonomy support may help these children maintain their arousal at manageable levels, think more clearly during the challenge, and enable them to practise implementing selfgenerated solutions for task completion, facilitating development of successful goal-directed behaviour (Blair, 2002).

Contrary to expectations, maternal warm guidance did not predict children's inhibitory control scores in either the CM or non-CM groups, nor did temperamental negativity moderate its effects on inhibitory control. Although research has shown that warm, sensitive parenting facilitates self-regulation development (e.g., McCabe et al., 2004; Sroufe, 1996; Thompson, 1991), the present findings suggest that temperamentally negative preschoolers appear more sensitive to a combination of warm parenting that specifically supports their independence, rather than parenting that provides positive control or guidance. That parents' warm support for age-appropriate independence (see SASB Figure 2 Cluster 2) was associated with stronger inhibitory control skills is consistent with findings from a recent meta-analysis (Karreman et al., 2006) summarizing 41 studies of preschool children's self-regulation development. Studies to date have not established a link between parental warm guidance (i.e., positive control) in the preschool years and indices of children's inhibitory control. Instead, preschool children's committed compliance is strongly associated with both positive (e.g., warm guiding) and negative (e.g., hostile, critical, and power asserting) forms of parent control, suggesting that variations in parental control of preschool children playa more important role in other behavioural aspects of self-regulation (e.g., compliance with parental directives; Karreman et al., 2006). Thus, while warm guidance appears important to aspects of children's compliance development, it may be less influential to other aspects of children's selfregulation, such as inhibitory control. Of note, however, is that a few studies of parenting in infancy/toddlerhood have documented linkages between maternal warm guidance (i.e., positive control) observed in the first few years of life and inhibitory control in early childhood (e.g., Moilanen et al., 2010). Collectively, these findings point to an early role for warm guidance followed by an increasing role for warm support of child autonomy over time from infancy into the preschool years for optimal development of children's inhibitory control skills. In other words, successful inhibition of pre-potent or dominant responding among preschool children may benefit most when parents provide warm support for children's efforts to implement self-generated solutions when faced with a cognitive challenge.

The present study has several strengths, namely the inclusion of a high-risk sample and independent, observational assessments of parenting and inhibitory control. Use of SASB coding technology enabled distinctions between warm parent behaviours that focused on autonomy promotion versus those that were focused on guiding or managing the child (i.e., through positive control). SASB's extensive use in intervention studies designed to clarify mechanisms of change (e.g., Benjamin, 1996; Benjamin, Rothweiler, & Critchfield, 2006; Constantino, 2000) also promotes ease of interpretation and facilitates consolidation of findings across developmental and intervention studies. While previous research has examined Temperamental Negativity × Caregiving effects on child behaviour problems (e.g., Belsky et al., 1998; Mesman et al., 2009), the current study extends evidence of a Temperamental Negativity × Caregiving effect on infants' and toddlers' inhibitory or effortful control (e.g., Poehlmann et al., 2011), to variation in preschool children's inhibitory control in CM and non-CM children.

The limitations of this study include its cross-sectional design and restricted sampling of parenting to a brief laboratory task. Future research should extend observation of parenting over a longer time frame and into the home environment. Though assessments of parenting quality, children's temperament, and inhibitory control were behaviourally based and obtained in independent contexts, all were obtained over the course of a 2–3-week time

frame, and as such, conclusions regarding temporal or causal associations are not possible. Follow-up investigation is needed to clarify whether parental warm autonomy support predicts subsequent development of temperamentally negative children's inhibitory control or, instead, if negative children who show greater inhibitory control in fact pull for more positive autonomy support from caregivers. Would warm parental guidance observed earlier in the toddler years show later positive effects on inhibitory control in preschool (e.g., Moilanen et al., 2010), and would this effect occur in all children or only CM-exposed children? A longitudinal follow-up of temperamentally negative children is needed in order to better understand the impact on self-regulation of broad social address effects (i.e., CM exposure), proximal parenting effects, and their intersection with children's constitutionally based differences in temperament. The use of SASB coding technology, with its ability to distinguish warm and hostile forms of control and differentiate warm sensitive parenting that targets autonomy promotion versus guiding/protecting can enhance the study of parenting processes that support optimal development in early childhood. SASB coding may be employed in further efforts to clarify the optimal balance of warm guidance and warm autonomy support that best promotes the constellation of temperamentally negative children's self-regulation skills, school readiness, mental health, and prosocial behaviour.

The present findings have implications for intervention with both parents and children across the spectrum of risk. Both CM and non-CM parents of temperamentally negative children may benefit from Parent–Child Interaction Therapy (PCIT; Eyeberg & Robinson, 1983; Urquiza & McNeil, 1996), which involves live parental coaching aimed at enhancing positive parenting behaviour and improving child behaviour management skills. The first phase of PCIT, Child-Directed Interaction (CDI), focuses on improving the parent–child relationship, and parents are coached to engage in positive behaviours (i.e., reflections, praises, and description of what the child is doing) based on the child's leads, enhancing parental support for children's prosocial autonomy. Mounting evidence shows that PCIT is effective at improving parenting and the parent–child relationships and reducing behaviour problems in children (e.g., Eyberg, Funderburk, Hembree-Kigin, McNeil, Querido, & Hood; Hood & Eyeberg, 2003; Timmer, Ware, Urquiza, & Zebell, 2010). Also, PCIT has been adapted for maltreating families (Urquiza & McNeil, 1996) and has been shown to produce a decline in re-abuse rates (Chaffin et al., 2004), through increases in positive parenting in the CDI phase of treatment (Hakman, Chaffin, Funderbunk, & Silvosky, 2009).

In addition to parent–child intervention programmes, temperamentally negative children may also benefit from child-focused interventions aimed at improving inhibitory controlexecutive functioning abilities (Diamond & Lee, 2011). Through repeated exposure and increasing challenge, improvements in executive functioning skills have been demonstrated through child engagement in computer-based training in attentional control, non-computerized games, yoga, and mindfulness training (Diamond & Lee, 2011). Further research is needed to determine the individual and joint contributions of parenting interventions and child-based attentional training for improving inhibitory control skills among temperamentally negative children across the spectrum of CM exposure.

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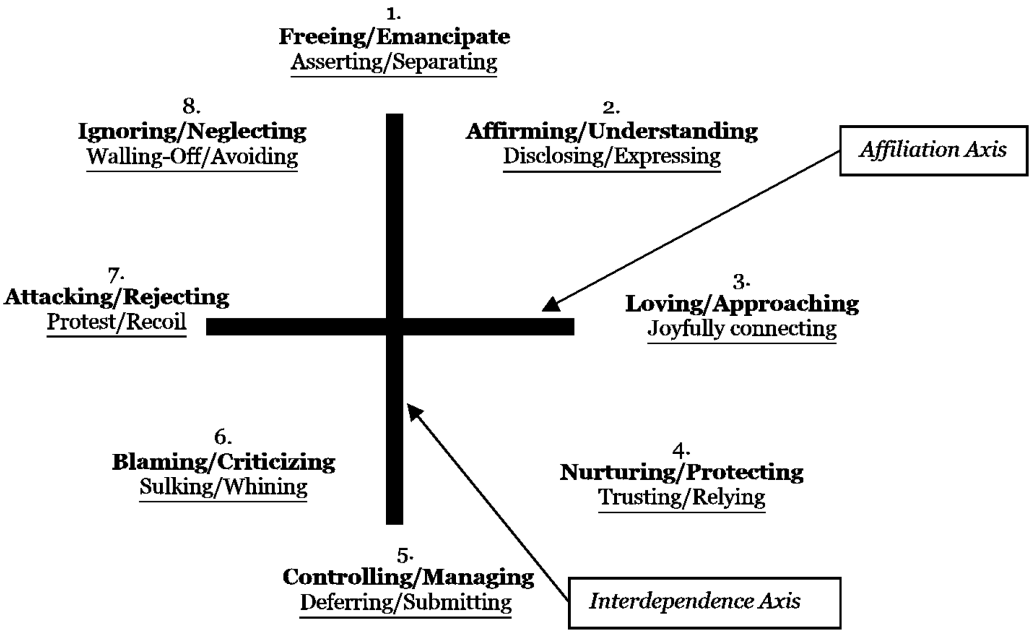

Figure 1.
SASB simplified cluster model. The affiliation axis is the *x*-axis and the interdependence axis is the *y*-axis. Labels in bold print describe proto-typical parenting behaviours directed towards another person (i.e., child) and are the focus in the present study. Labels in underlined print describe proto-typically child-like actions in response to the other (intransitive).

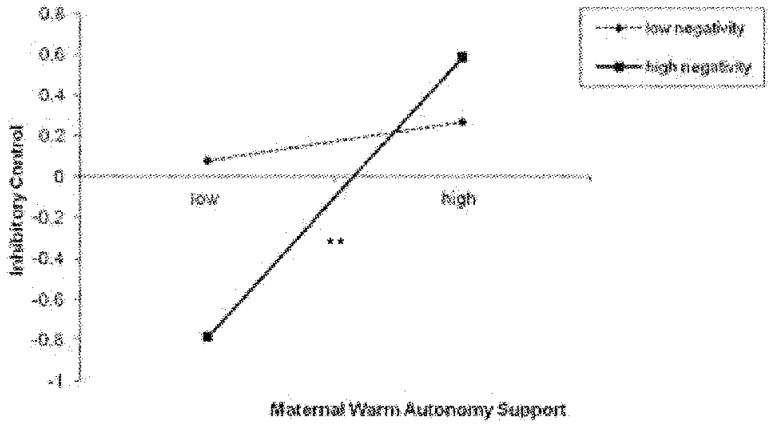

Figure 2.
Children's inhibitory control as a function of maternal warm autonomy support (Cluster 2) and child temperamental negativity. $^{**}p < .01$.

Table 1

Descriptive statistics for study variables from CM, non-CM, and the total sample and differences among study variables by CM group

	CM (*N* = 64)			Non-CM (*N* = 54)			Total sample (*N*= 118)		
	M	***SD***	**Range**	***M***	***SD***	**Range**	***M***	***SD***	**Range**
Temperamental negativity	4.54	1.84	1.0–8.0	4.15	1.48	1.0–7.0	4.35	1.69	1.0–8.0
Warm autonomy support (Cluster 2)	0.14	0.12	0.00–0.67	0.18	0.13	0.00–0.57	0.16	0.14	0.00–0.71
Warm guidance (Cluster 4)	0.51	0.18	0.15–0.93	0.54	0.21	0.10–0.95	0.52	0.20	0.10–0.95
Strict/hostile control (Clusters 5 and 6)	0.31 a	0.21	0.00–0.74	0.23 a	0.21	0.00–0.71	0.27	0.21	0.00–0.74
Inhibitory control	−1.01 a	1.97	−4.11–1.68	0.30 a	1.59	−4.31–2.15	0.04	1.61	−4.31–2.15

Note Means in the same row that share the same letter differ at the $p < .05$ level. *M* = Mean. *SD* = standard deviation. Autonomy support is SASB Cluster 2 (i.e., affirm), warm guidance is SASB Cluster 4 (i.e., protect), and strict/hostile control is the sum of SASB Clusters 5 and 6 (i.e., control and criticize). Inhibitory control scores equal the sum of the standardized scores during shapes and day/night tasks.

Table 2

Bivariate correlations between temperamental negativity, parenting, and inhibitory control in the full sample and for CM and non-CM groups

	Total sample					Non-CM group					CM group				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
1. Temperamental negativity	—					—					—				
2. Warm autonomy support (Cluster 2)	−.06	—				−.04	—				−.05	—			
3. Warm guidance (Cluster 4)	−.05	−.12	—			.07	−.19	—			−.13	−.08	—		
4. Strict/hostile control (Clusters 5 and 6)	.09	−.49**	−.79**	—		−.02	−.43**	−.79**	—		.12	−.51**	−.80**	—	
5. Inhibitory control	−.25**	.39**	.10	−.32**	—	−.24	.31*	.05	−.23	—	−.22	.41**	.13	−.33*	—

Note:

* $p < .05$,

** $p < .01$.

Table 3

Standardized regression coefficients for temperamental negativity, parenting behaviours, and their interactions as predictors of inhibitory control

	B	*SE* (*B*)	β	Δ R^2
Step 1				.08*
CM status	−0.41	0.36	−.13	
Household income	0.09	0.20	.05	
Maternal education	0.14	0.08	.18	
Step 2				.23***
Child age	0.94***	0.20	.43	
SB-5	.04***	.01	.32	
I. Warm autonomy support (Cluster 2)				
Step 3				.04+
Autonomy support	2.51*	1.17	.20	
Negativity	−0.07	0.08	−.08	
Step 4				.04*
Negativity × Autonomy	1.27*	0.61	.17	
Total ΔR^2				.38
II. Warm guidance (Cluster 4)				
Step 3				.01
Warm guidance	0.18	0.72	.02	
Negativity	−0.08	0.09	−.08	
Step 4				.00
Negativity × Warm guidance	0.09	0.41	.02	
Total ΔR^2				.32
III. Strict/hostile control (Clusters 5 and 6)				
Step 3				.02
Strict hostile control	−1.08	0.73	−.14	
Negativity	−0.09	0.09	−.09	
Step 4				.01
Negativity × Strict/Hostile Control	−0.39	0.38	−.09	
Total ΔR^2				.34

Note: Steps 1 and 2 are the same for all three models. *B* = unstandardized beta coefficient. SE (*B*) = standard error of unstandardized beta coefficient, β = standardized beta coefficient. ΔR^2 = *R*-squared change value.

+ $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$.